

More oribatids from Thailand (Acari: Oribatida)

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More oribatids from Thailand (Acari: Oribatida). - Some of the oribatid material collected by members and co-workers of the Muséum d'histoire naturelle, Genève and of the Hungarian Natural History Museum, Budapest in Thailand is studied. 28 species were identified, 10 of them new to science: *Austrophthiracarus pseudotuberculatus*, *Rhacaplacarus* (R.) *semiaciculatus*, *Aokiella latiseta*, *Fissicepheus thaiensis*, *Gigantoppia magna*, *Pulchroppia sculpturata*, *Subiasella* (*Lalmoppia*) *khaolak*, *Vietoppia insitiva*, *Mahunkaia schwendingeri* and *Oribatella zsilavii*. The new genus *Gigantoppia* is established in the family Oppiidae. Some taxonomical and zoogeographical notes on rare and little known species of this region are presented. *Archegotocepheus* Mahunka, 1988 **stat. n.** is removed from the synonymy of *Megalotocepheus* Aoki, 1965 and now considered as a valid subgenus in *Megalotocepheus*.

Keywords: New taxa - new status - taxonomical and zoogeographical notes.

INTRODUCTION

Research results on the Oribatida fauna of Thailand, based on my own collection, were presented by Mahunka (1994, 1995a, 1995b, 2008) and Mahunka & Mahunka-Papp (1994). Many results on that fauna were published by Aoki (1965, 1968), Niedbala (2000) and Niedbala & Corpuz-Raros (1998). All information available in 1989 on Oriental Acari was compiled by L. A. Corpuz-Raros in an unpublished manuscript of 328 pages.

Intensive collecting in Thailand has been undertaken by members and co-workers of the Muséum d'histoire naturelle (MHNG) for many years. I received several mite samples from the rich material deposited in this museum. These samples and other material from Thailand revealed the occurrence of 28 species, of which 10 are new to science. One new genus is here established belonging to the family Oppiidae. It is noteworthy that among the listed species only a few had been mentioned from Thailand before. Furthermore, the known distribution area of those species known from Southeast Asia has somewhat been extended. *Allonothrus pyriformis* (Berlese, 1913), *Megalotocepheus* (*Archegotocepheus*) *singularis singularis* Mahunka, 1988, *Megalotocepheus* (*Archegotocepheus*) *brevisetus* Mahunka, 1989, *Senectoppia multisulcata* (Berlese, 1913) are reported from Thailand for the first time.

MATERIAL AND METHODS

As in my earlier papers, I follow the system of Marshall *et al.* (1987), based on that of Grandjean (1954, 1965), with some modifications introduced by Woas (2002), Subías (2004) and Weigmann (2006) and myself (Mahunka 2008). In the descriptions the morphological terminology of Grandjan (in several publications) is used with some modifications concerning the studied groups or organs (e.g., Norton *et al.*, 1997; Mahunka & Mahunka-Papp 2001; Niedbała, 1992, 2000, 2006 and the before mentioned publications).

All material examined is deposited in the Muséum d'histoire naturelle de Genève (MHNG) and in the Hungarian Natural History Museum, Budapest (HNHM).

LIST OF COLLECTING SITES

As-T-3 (MHNG): Phang Nga Prov., Khao Lak National Park, Tone Chong Fa Waterfall, 100-300 m, Winkler extraction in moist primary forest with secondary spots, 6.-15. I. 1998, leg. A. Schulz & K. Vock.

TH-07/05 (MHNG): Krabi Prov., Ao Luk Distr., mountain ca 1 km E of Ao Luk Tai, 80 m (semi-evergreen rainforest on limestone), 9./10.VII. 2007, leg. P. Schwendinger.

TH-04/17 (MHNG): Phang Nga Prov. & city, near Tapan Cave, 20 m (soil at base of limestone cliff), 9. IX. 2004, leg. P. Schwendinger.

TH-26 (MHNG): Phetchaburi Prov., Kaeng Krachan National Park, 450 m, 19. XI. 1985, leg. D. Burckhardt & I. Löbl.

As-709 (HNHM): Phetchaburi Prov., Kaeng Krachan National Park, Berlese sample from wet litter and soil near the water basin, with a lot of decaying debris, 9. II. 1994, leg. S. Mahunka & L. Mahunka-Papp.

As-832 (HNHM): Trang Prov., Khao Chong Botanical Garden, near the staff center, moss, 02. XII. 2003, leg. A. Orosz & G. Sziráki.

LIST OF STUDIED SPECIES

HYPOCHTHONIIDAE Berlese, 1910

Eohypochthonius crassisetiger Aoki, 1959

Locality: As-709.

STEGANACARIDAE Niedbała, 1986

Austrophthiracarus pseudotuberculatus sp. n.

Rhacaplacarus (R.) *semiaciculatus* sp. n.

ORIBOTRITIIDAE Grandjean, 1954

Indotritia propinqua Niedbała, 1991

Locality: As-709.

Oribotritia bulbifer (Mahunka, 1987)

Locality: TH-07/05.

THRYPOCHTHONIIDAE Willmann, 1931

Archeogozetes longisetosus Aoki, 1965

Localities: AS-T-3, TH-04/17.

LOHMANNIIDAE Berlese, 1916

Annectacarus krachan Mahunka, 1995

Locality: As-709.

Meristacarus longisetosus Mahunka, 1978

Locality: As-709.

Meristacarus tuloyus Corpuz-Raros, 1979

Locality: As-T-3.

Paulianacarus rugulosus (Mahunka, 1995)

Locality: As-709.

TRHYPOCHTHONIIDAE Willmann, 1931

Allonothrus pyriformis (Berlese, 1913)

Locality: As-709.

HETEROBELBIDAE Balogh, 1961

Heterobelba galerulata Berlese, 1913

Locality: TH-04/17.

CARABODIDAE C. L. Koch, 1837

Aokiella latiseta sp. n.

TETRACONDYLIDAE Aoki, 1961

Fissicepheus thaiensis sp. n.

OTOCEPHEIDAE Balogh, 1961

Megalotocepheus (Archegotocepheus) brevisetus Mahunka, 1989

Locality: As-T-3.

Megalotocepheus (Archegotocepheus) singularis singularis Mahunka, 1988

Locality: As-T-3.

Otocepheus (Acrotocepheus) excelsus Aoki, 1965

Locality: As-T-3.

Otocepheus (Otocepheus) heterosetiger Aoki, 1965.

Locality: As-T-3.

OPPIIDAE Sellnick, 1937

Gigantoppia magna gen. n., sp. n.

Pulchroppia sculpturata sp. n.

Senectoppia multisulcata (Berlese, 1913)

Localities: TH-26, As-709.

Subiasella (Lalmoppia) khaolak sp. n.

Vietoppia insitiva sp. n.

EREMAEZETIDAE Piffli, 1972

Mahunkaia schwendingeri sp. n.

AUSTRACHTERIIDAE LUXTON, 1985

Allozetes pusillus (Berlese, 1913)

Locality: TH-04/17.

Lamellobates molecula (Berlese, 1916)

Locality: As-709.

ORIBATELLIDAE Jacot, 1925

Oribatella zsilavii sp. n.

GALUMNIDAE Jacot, 1925

Bigalumnella csavatorum Mahunka, 1994

Localities: TH-26, As-709.

NOTES ON THE SPECIES STUDIED AND DESCRIPTIONS OF NEW TAXA

Eohypochthonius crassisetiger Aoki, 1959

Figs 1-2

REMARKS: Although Aoki's (1977) description corresponds well with the morphological characters of the specimens examined, attention should be drawn to some deviations. The specimens at hand are smaller (288-305 μm), the rostral setae are somewhat longer, the interlamellar setae are blunt and rather spoon-shaped, the sensillus is strongly widened in the middle. On the other hand, the following morphological features are identical: The shape of the postlateral protuberance of the prodorsum, the broad and densely aciculated interlamellar setae, the shape and length of the notogastral setae (Fig. 1). In comparing the drawing (Fig. 2) of Corpuz-Raros & Garcia (2003) with that of Aoki other differences are visible, as e.g. the shape of the notogastral and interlamellar setae. So, the material from the Philippines may not be conspecific.

Austrophthiracarus pseudotuberculatus sp. n.

Figs 3-9

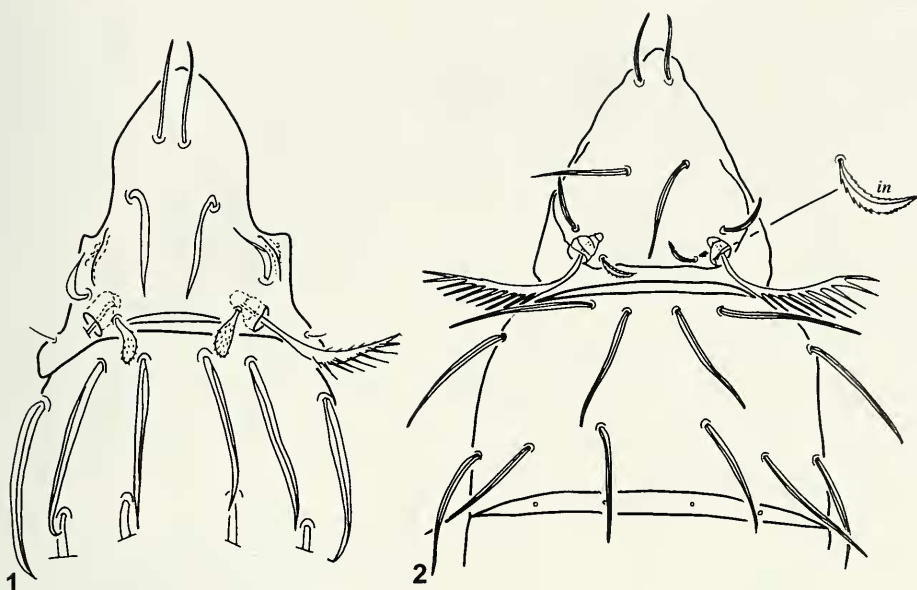
MATERIAL EXAMINED: Holotype: Phang Nga Prov., Khao Lak National Park, Tone Chong Fa Waterfall, 100-300 m, Winkler extraction in moist primary moist forest with secondary spots, 6.-15. I. 1998, leg. A. Schulz & K. Vock (As-T-3), deposited in MHNG.

DIAGNOSIS: Entire body surface ornamented with deep alveoli. Prodorsal outline undulating, with two hollows in lateral view. A pair of median cristae present. Lateral carina short, lateral rim weakly developed. Rostral setae short and smooth, interlamellar setae strong, erect, aciculate, lamellar setae minute. Sensillus long, curved, directed outwards, its head well aciculate. Fifteen pairs of notogastral setae also strong and aciculate, two pairs of vestigial notogastral setae and two pairs of lyrifissures present. Two shorter pairs of anal and one very long pair of adanal setae (ad_1) located along the inner margin of the ano-adanal plates. One pair of setae (ad_2) laterally to them, ad_3 similar to the anal setae. Genital setae arranged in two longitudinal rows.

MEASUREMENTS: Length of aspis 416 μm , length of notogaster 886 μm , height of notogaster 512 μm .

DESCRIPTION: *Aspis*: Surface mostly with rough sculpture, formed by deep alveoli. A pair of long, parallel median cristae present, connected anteriorly, nearly M-shaped (Fig. 8). Their small apices bearing smooth, thin but spinose rostral setae. Lateral carina short, lateral rim similar in length, its anterior part absent, and both lines reaching the sinus-line (Fig. 9). Median posterior apodema well observable. Lamellar setae minute, very thin, interlamellar setae bacilliform, finely aciculate. Sensillus directed upwards and outwards, curved, long, its head well dilated, distal end aciculate (Fig. 4). Exobothridial setae minute.

Notogaster: Surface ornamented by strong, deep, cup-shaped alveoli (Fig. 3), in their inner part a point observable. Fifteen pairs of long, mostly anteriorly curved, spiniform and aciculate notogastral setae present, the vestigial f_1 seta situated behind h_1 , close to it. Setae c_3 situated at the collar line, all other setae c located far from the collar line (Fig. 3). Lyrifissures hardly visible, only *ia* and *im* observable.



FIGS 1-2

Eohypochthonius crassisetiger Aoki, 1959. (1) Specimen from Thailand. (2) Specimen from the Philippines (after Corpuz-Raros & Garcia, 2003).

Ventral parts: A well-developed keel present on the ano-adanal plates (Fig. 7), reaching insertion of posterior adanal setae (ad_1). Three pairs of ano-adanal setae situated on inner margin of ano-adanal plates, anal setae equal in length. Two pairs of adanal setae nearly twice longer than anal setae, the fifth setae (ad_3) nearly as long as the anal setae (Figs 5,7). All setae finely roughened. Nine pairs of genital setae present, originating in two longitudinal rows; setae $g_1 - g_4$ much longer and more strongly curved than the others, located further from the inner margin. All genital setae straight.

Legs: All legs monodactylous. Setae d on femur I thick and curved (Fig. 6), setae v'' very long, more than five times longer than setae v' .

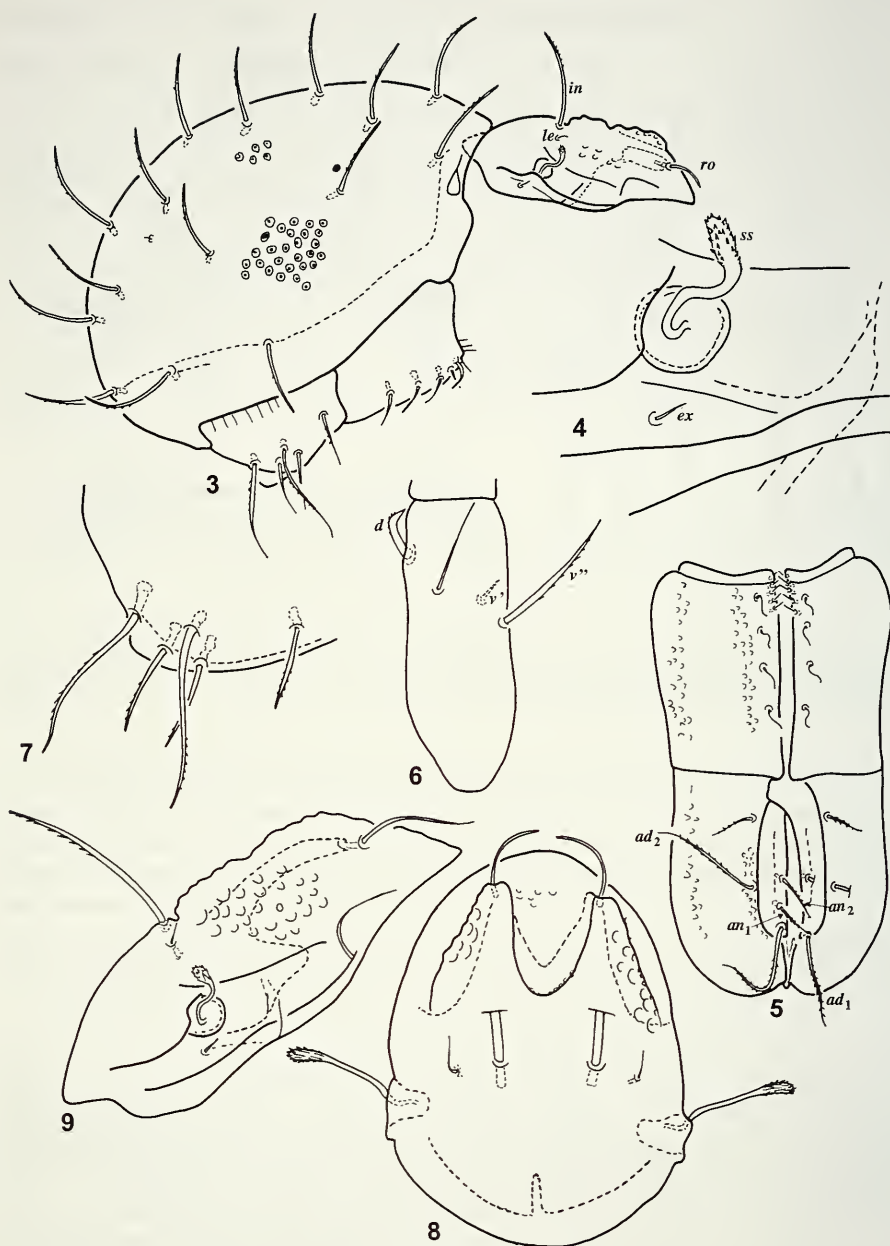
REMARKS: The new species is very similar to *Austrophthircarus tuberculatus* (Niedbala & Corpuz-Raros, 1998). Both species differ primarily by the form of the long and well protruding median crista on the ano-adanal plates, by the form of the prodorsal cristae (much longer in *tuberculatus*) and by the length and the insertions of the rostral setae (much longer and arising between the cristae in *tuberculatus*).

ETYMOLOGY: The species name refers to similarities with the related species.

***Rhacaplacarus (R.) semiaciculatus* sp. n.**

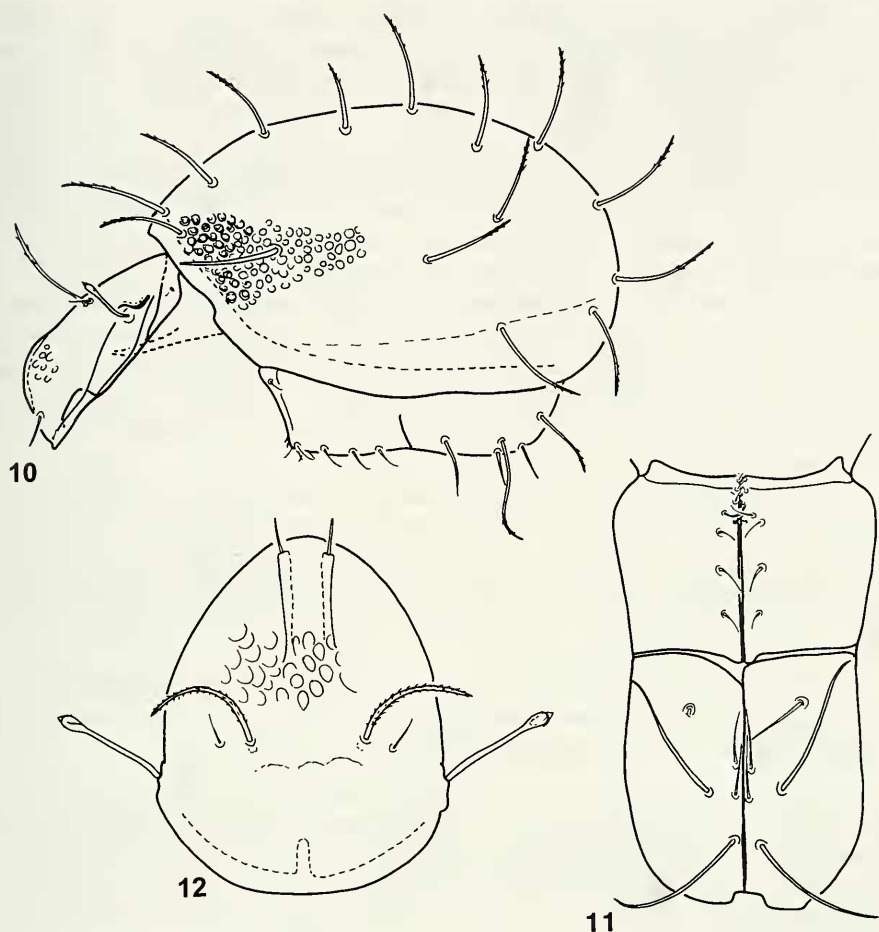
Figs 10-12

MATERIAL EXAMINED: Holotype: Phang Nga Prov., Khao Lak National Park, Tone Chong Fa Waterfall, 100-300 m. Winkler extraction in primary moist forest with secondary spots, 6.-15. I. 1998, leg. A. Schulz & K. Vock (As-T-3). 1 paratype from the same sample. Holotype deposited in MHNG, paratype (1758-PO-2008) in HNHM.



FIGS 3-9

Austrophthiracarus pseudotuberculatus sp. n. (3) Body in lateral view. (4) Trichobothrium. (5) Genitoanal region. (6) Femur I. (7) Anal setae. (8) Aspis in dorsal view. (9) Aspis in lateral view.



FIGS 10-12

Rhacaplacarus (R.) semiaciculatus sp. n. (10) Body in lateral view. (11) Genitoanal region. (12) Aspis in dorsal view.

DIAGNOSIS: Body surface ornamented by large alveoli. Median crista present, lateral carina long, reaching over the sinus-line. Lateral rim short. Rostral and lamellar setae short, spiniform and smooth; interlamellar setae strong, erect, scarcely aciculate; exobothridial setae represent only by alveoli. Sensillus long, directed outwards, its head rounded. Fifteen pairs of strong and distally slightly aciculate notogastral setae present. Two pairs of anal setae arising along the inner margin of the ano-adanal plates. One pair of setae (ad_2) laterally to them, ad_3 longer than the anal ones. Genital setae arranged in two longitudinal rows.

MEASUREMENTS: Length of aspis 346-412 μm , length of notogaster 762-872 μm , height of notogaster 541-638 μm .

DESCRIPTION: *Aspis*: Surface mostly with rough sculpture formed by deep alveoli medially. Lateral and basal parts nearly smooth. A long, only slightly protruding median crista present, its anterior part bearing rostral setae. Lateral carina long, reaching over the sinus-line and much longer than the lateral rim. Posterior median apodema well observable. Rostral and lamellar setae very short, straight, narrow-spiniform. Interlamellar setae very long, curved laterally, spiniform, very finely aciculate. Aciculi located only at their distal end. Sensillus directed upwards and outwards, straight in dorsal view (Fig. 12); its head well dilated, distal end slightly aciculate. Exobothridial setae represented only by their minute alveoli.

Notogaster: Surface ornamented with strong, deep, rounded, well-marked alveoli (Fig. 10); their diameter much longer than the distance between the alveoli. Fifteen pairs of long, mostly anteriorly curved, spiniform and distally finely aciculate notogastral setae present; the alveoli of the vestigial f_1 and f_2 setae not observable. Setae c_1 and c_3 arising at the collar line, position of other setae as shown in Fig. 10. Lyrifissures not visible.

Ventral parts: Three pairs of ano-adanal setae situated on inner margin of ano-adanal plates; anal setae equal in length; setae ad_1 shorter than ad_2 . Fifth setae (ad_3) clearly longer than anal ones (Fig. 11). All setae finely aciculate. Nine pairs of genital setae present, originating in two longitudinal rows; setae $g_1 - g_4$ much longer and distinctly curved, more strongly so than others, located further away from inner margin. All genital setae curved.

Legs: All legs monodactylous. Setae d on femur I thick and curved, setae v'' very long, more than three times longer than setae v' . Setae d of tibia IV long and independent of solenidia, both very long, filiform.

REMARKS: The new species is closely related to *Rhacaplacarus indicus* Bayoumi & Mahunka, 1979 [= *Plonaphracarus indicus* (Bayoumi & Mahunka, 1979) according to Subias 2004] and belongs to the *kugohi* species group. The rostral setae of the new species are smooth, short (much longer and aciculate in *indicus*), its exobothridial setae are represented only by alveoli (present as setae in *indicus*) and its alveoli are much larger and stronger than in related species.

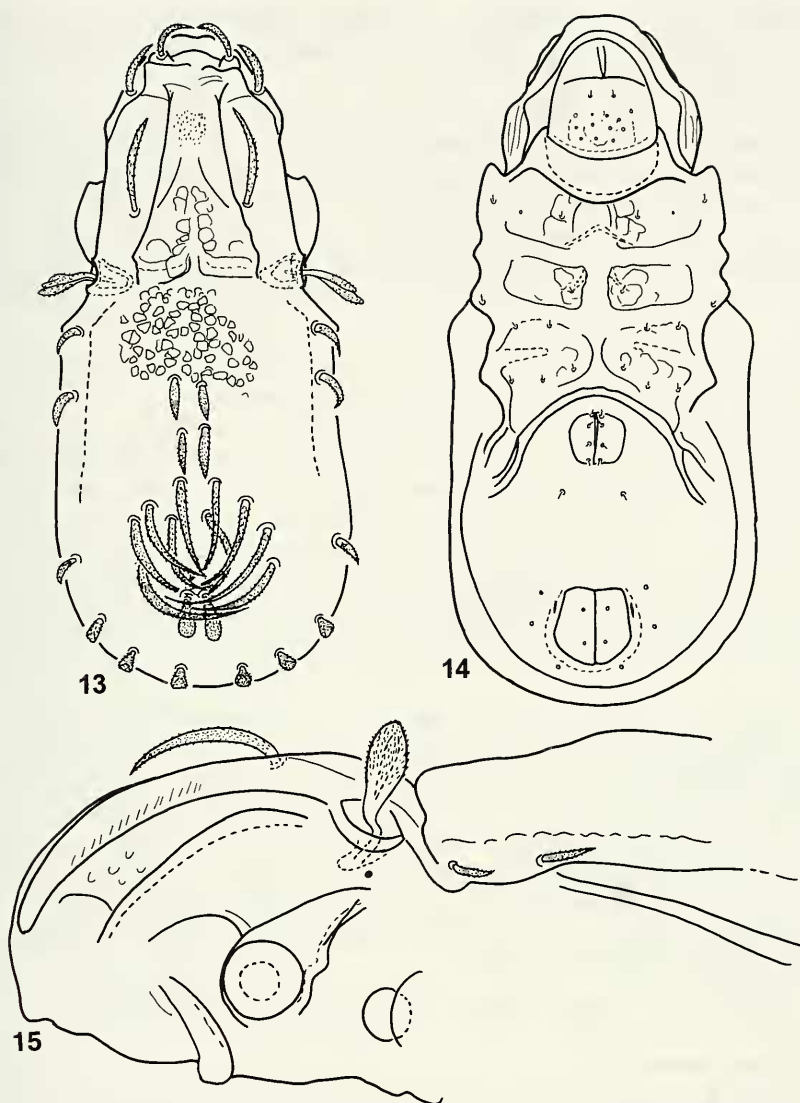
ETYMOLOGY: The species name refers to the characteristically aciculate prodorsal and notogastral setae.

Aokiella latiseta sp. n.

Figs 13-15

MATERIAL EXAMINED: Holotype: Phang Nga Prov. & city, near Tapan Cave, 20 m (soil at base of limestone cliff), 9. IX. 2004, leg. P. Schwendinger (TH-04/17). 1 paratype from the same sample. Holotype deposited in MHNG, paratype (1759-PO-2008) in HNHM.

DIAGNOSIS: Whole body surface covered with thin, partly broken cerotegument. Rostral setae slightly lamellar and interlamellar ones distinctly dilated. Interlamellar setae arising from lamellar surface. Interlamellar region punctulate anteriorly, with five pairs of large maculae. Sensillus spoon-shaped, with two distinctly barbed marginal crests. Notogaster with 14 pairs of dilated, nearly phylliform notogastral setae, six pairs of them forming a posteromedian knot. All setae in the ventral region minute, hardly discernible. Genito-anal setal formula: 4 - 1 - 2 - 3. All legs monodactylous.



FIGS 13-15

Aokiella latiseta sp. n. (13) Body in dorsal view. (14) Body in ventral view. (15) Anterior part of podosoma in lateral view.

MEASUREMENTS: Length of body 373-396 μm , width of body 159-170 μm .

DESCRIPTION: *Prodorsum*: Rostrum widely rounded, without apex. Lamellae situated laterally, well-developed, their surface smooth, lateral margin grooved. Inter-lamellar region punctate anteriorly, with some crests, directed anteriorly and carrying five pairs of large alveoli in posteromedian part (Fig. 13). Rostral setae spindle-shaped,

short; lamellar setae comparatively thin, thinner than other dorsal setae; interlamellar setae long, similar in shape. Sensillus spoon-shaped, large, directed outwards. Two marginal veins well observable.

Notogaster: Whole surface covered by small angular tubercles forming polygonal groups. Fourteen pairs of notogastral setae present. No setae in sejugal region medially, two pairs in humeral, four pairs in posteromarginal region, two anteromedian pairs located one behind the other in a longitudinal position medially. Remaining setae (six pairs) forming a posteromedian group located also medially, standing in opposite directions, crossing each other (Fig. 13). All notogastral setae dilated, mostly spindle- or ribbon-shaped, roughened, setae in the posteromedian groups much longer than others.

Lateral part of podosoma: Tutorium weakly developed, without apex (Fig. 15). Pedotectum 1 large, completely covering the acetabulum of leg I.

Ventral parts (Fig. 14): Surface of infracapitulum rarely foveolate, setae *h* minute. Apodemes and epimeral borders well-developed, except *bo*. 3, forming a closed network. Posterior borders of epimeral region conspicuously strong, well-sclerotised. Epimeres with large polygonal fields mostly along sternal borders. Epimeral setal formula: 3 - 1 - 3 - 3. All setae minute, or represented only by their alveoli. Surface of ventral, genital and anal plates smooth. All their setae also very small, or only their alveoli visible. Genitoanal setal formula: 4 - 1 - 2 - 3, all setae hardly observable. Adanal setae located very near to anal apertures, lyrifissures *iad* also in adanal position.

REMARKS: The genus *Aokiella* Balogh & Mahunka, 1967 is considered by Subias to be a subgenus of *Odontocephus* Berlese, 1913. I do not agree with him, although, no doubt, some kind of relationship exists between the two taxa. The structure of the dorsosejugal region of *Aokiella* is different, the notogastral setae are arranged in a posteromedial group, and the shape of the tutorium clearly separates the species of *Aokiella* from others. Only the type species (*A. florens* Balogh & Mahunka, 1967), *A. latisetula* sp. n. and one other species (*A. rotunda* Hammer, 1979) belong to this lineage. The new species may readily be differentiated from both close relatives by the position and the form of its setae.

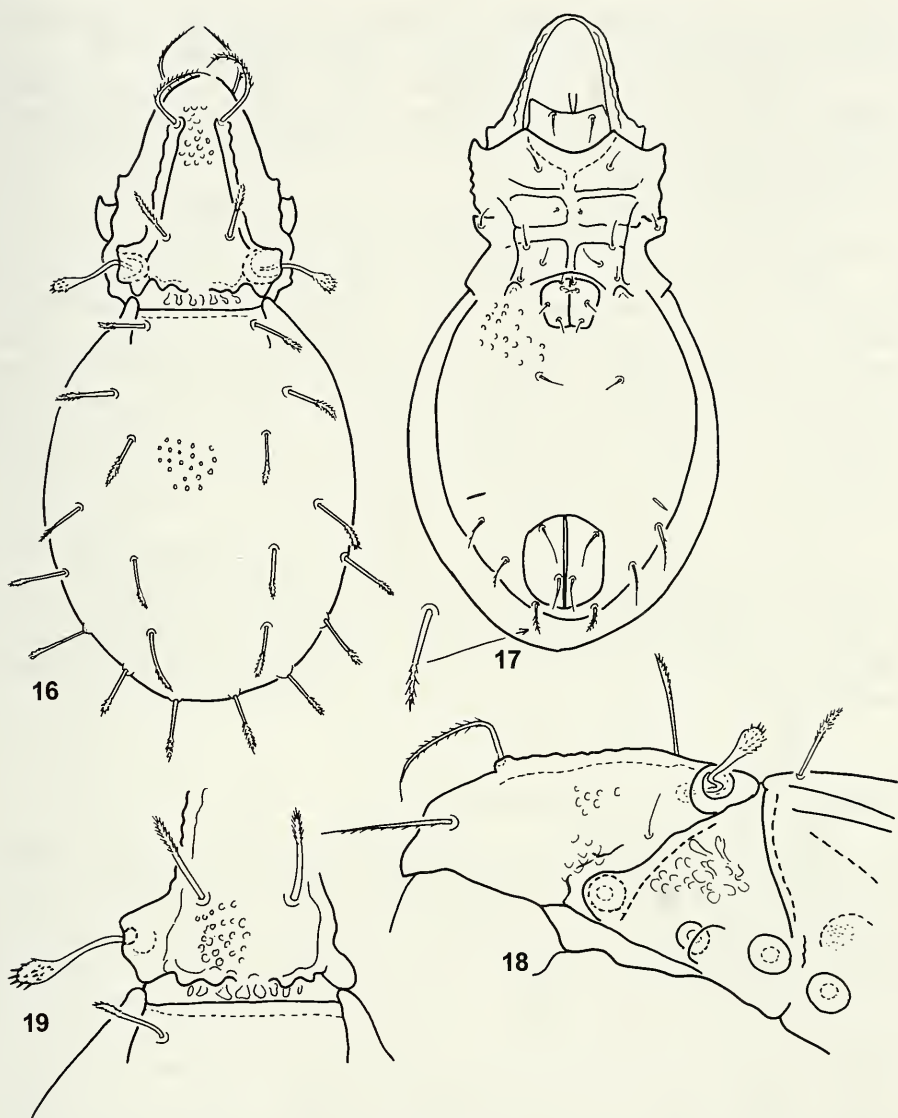
ETYMOLOGY: The species name refers to the wide dorsal setae.

Fissicephus thaiensis sp. n.

Figs 16-19

MATERIAL EXAMINED: Holotype: Phetchaburi Prov., Kaeng Krachan National Park, Berlese sample from wet litter and soil near the water basin, with a lot of decaying debris, 9. II. 1994, leg. S. Mahunka & L. Mahunka-Papp (As-709). 1 paratype from the same sample. 1 paratype: Phetchaburi Prov., Kaeng Krachan National Park, 450 m, 19. XI. 1985, leg. D. Burckhardt & I. Löbl (TH-26). Holotype (1760-HO-2008) deposited in HNHM, 2 paratypes in MHNG.

DIAGNOSIS: Lamellae narrow, lamellar setae situated on their apices. Prodorsal condyles laterally present as a pair of waved laths. Behind them three pairs of small, weak tubercles. Peduncle of sensillus long, its head short, with spines. Notogaster with one pair of lateral tubercles, anterior border of notogaster straight medially. Ten pairs of equally long notogastral setae, all pilose in their distal third. Epimeral setal formula: 2 - 0 - 2 - 3. Four pairs of genital setae, aggenital condyles weak.



FIGS 16-19

Fissicepheus thaiensis sp. n. (16) Body in dorsal view. (17) Body in ventral view. (18) Anterior part of podosoma in lateral view. (19) Dorsosejugal region.

MEASUREMENTS: Length of body 560-573 μm , width of body 276-284 μm .

DESCRIPTION: *Prodorsum*: Surface distinctly foveolate. Lamellae converging anteriorly (Fig. 16), their surface also ornamented with foveolae. Bothridium with basal tubercle. Behind the condyles some irregular and weakly developed tubercle (Fig. 19) also present. Rostral setae setiform, lamellar setae characteristically curved

inwards (Fig. 16) and peculiarly ciliate. Interlamellar setae bacilliform, with distinctly barbed distal third. Sensillus long, with small, rounded barbed head.

Notogaster: One pair of notogastral condyles located in humeral position. Median sejugal lines straight, without structure. Surface of notogaster similar to that of prodorsum, ten pairs of setae bacilliform (like interlamellar setae) and barbed (Fig. 16). All of same length and form.

Lateral part of podosoma: Exobothridial setae thin, pedotecta I long, round. Pedotecta 2-3 small, typical for the genus (Fig. 18).

Ventral parts (Fig. 17): Apodemes well-developed, a transversal lath also present in front of the genital aperture. Genital condyles weak, opposite them a longer, thin line with triangular end in epimeral region. Epimeral setae simple, thin, setiform, setae 1a, 2a and 3a reduced and/or absent. Surface of ventral plate foveolate. Four pairs of genital setae simple, short; aggenital ones longer; anal setae longest of all on ventral plate. Adanal setae more strongly ciliate than others in this region, like the dorsal setae. Posterior anal setae arising much closer to each other than the anterior ones. Lyrifissures *iad* located laterally, far from anal apertures, in front of setae *ad*₃.

REMARKS: On the basis of the form and length of the sensillus and the form of the notogastral setae, the species of the genus *Fissicepheus* Balogh & Mahunka, 1965 can be divided into three groups. The new species belongs to the second group, which is characterised by a long sensillus and distally well pilose notogastral setae. The new species is well distinguished from all congeners by the form of the condyles and of the basal tubercles of the prodorsum, as well as by the bacilliform notogastral setae.

ETYMOLOGY: Named after its country of origin.

Subgenus *Archegotocepheus* Mahunka, 1988 **stat. n.**

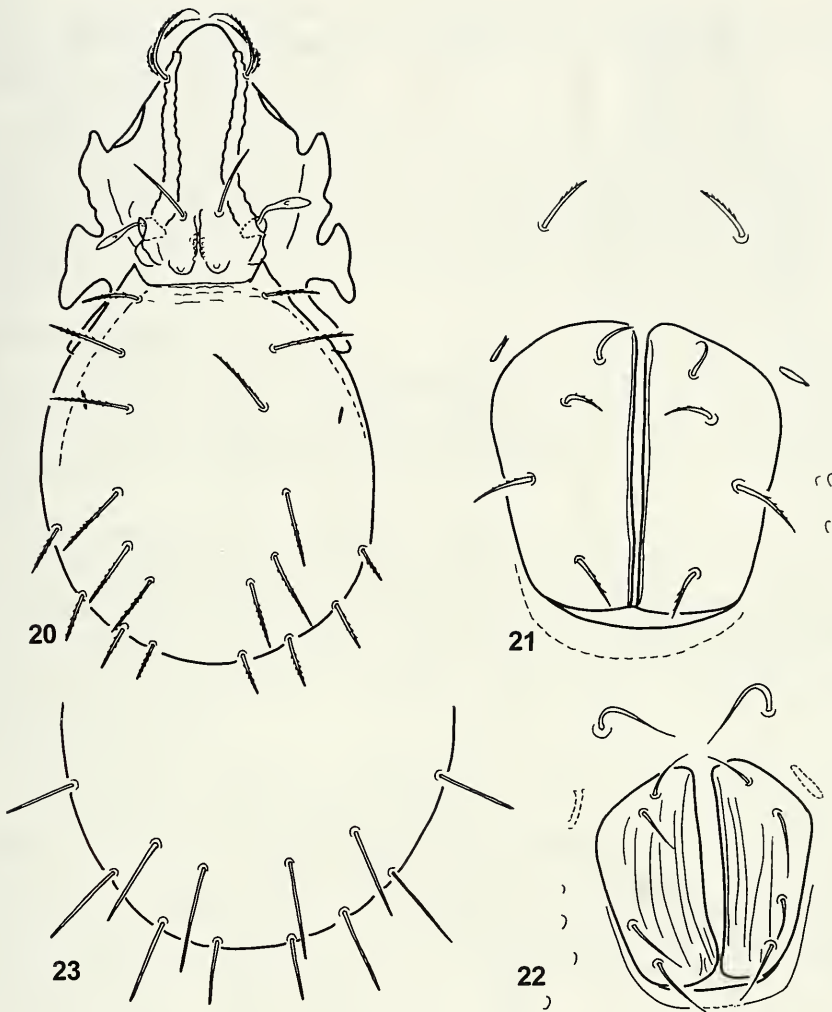
REMARKS: Mahunka (1988) described *Archegotocepheus* as a genus (with two new species in it) from Sabah (East Malaysia) on the basis of its anal neotrichy. Later Subias (2004), in his new system, synonymized *Archegotocepheus* with *Megalotocepheus* Aoki, 1965, arguing about the generic value of this feature. When describing *M. latus*, Aoki (1965) did not establish a separate genus for that single species, because it then was the only one known with this feature. My opinion is that the presence of the anal neotrichy in three species is synapomorphic and clearly distinguishes them from all other species. In other words, the establishment of a taxon in the genus group is more than justified. Since other subgenera already exist in the family Otocephidae, *Archegotocepheus* is here removed from synonymy and retained as a subgenus of *Megalotocepheus*. Therefore I propose the following combinations:

Megalotocepheus (*Archegotocepheus*) *brevisetus* (Mahunka, 1989) (Figs 20-21)

Megalotocepheus (*Archegotocepheus*) *latus* Aoki, 1965

Megalotocepheus (*Archegotocepheus*) *singularis singularis* (Mahunka, 1988) (Figs 22-23)

It is interesting to note that *brevisetus*, *singularis* and *latus* were all discovered in Thailand, and what is even more interesting, that the first two species were collected from the same sample.



FIGS 20-23

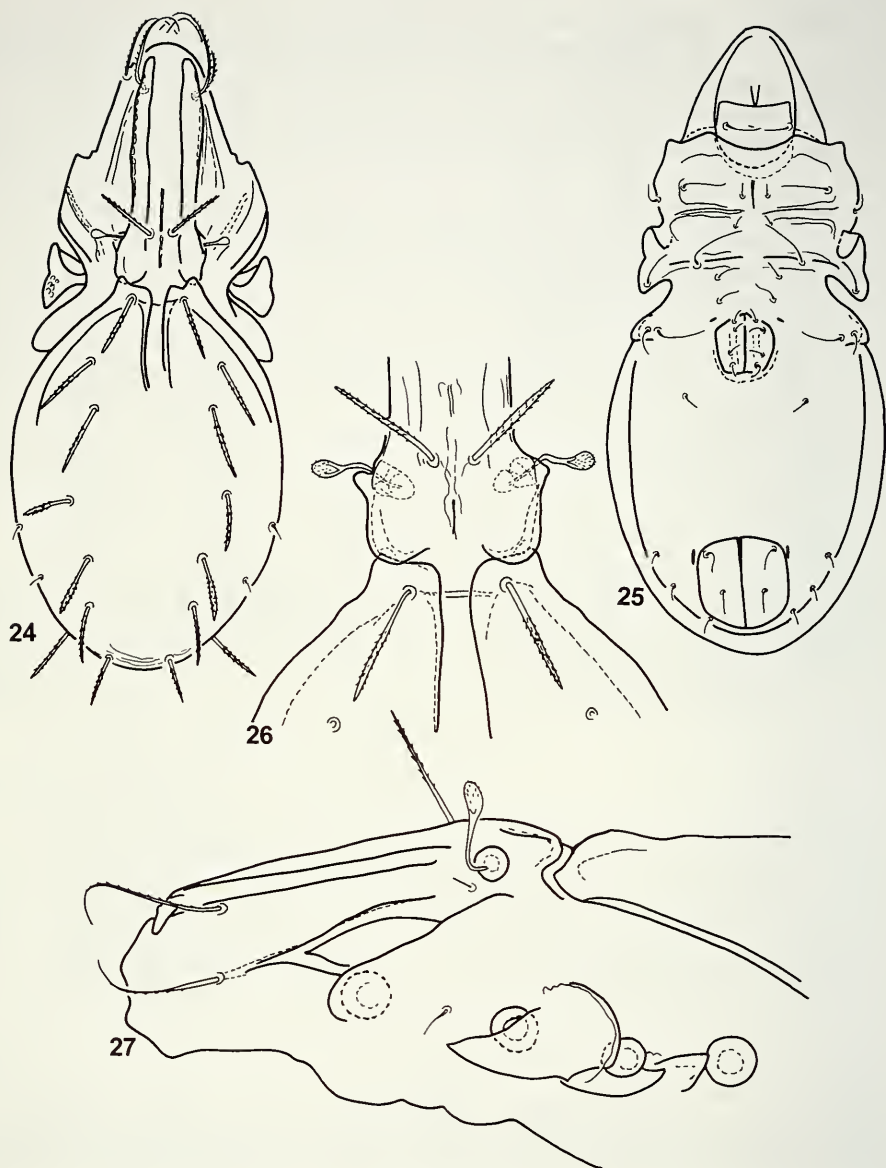
Megalotocepheus (A.) *brevisetus* Mahunka, 1989. (20) Body in dorsal view. (21) Genital plates. *Megalotocepheus* (A.) *singularis singularis* Mahunka, 1988. (22) Genital plates. (23) Posterior end of notogaster.

***Otocepheus* (*Otocepheus*) *heterosetiger* Aoki, 1965**

FIGS 24-27

REMARKS: Detailed examination of the available specimens revealed the species as variable, especially concerning the notogastral setae. Part of the notogastral setae (lp , h_1 and h_2) are slightly dilated and curved. Figures are given for the recently collected specimens (Figs 24-27).

MEASUREMENTS: Length of body 1038-1302 μm , width of body 430-582 μm .



FIGS 24-27

Oiocephus (*O.*) *heterosetiger* Aoki, 1965. (24) Body in dorsal view. (25) Body in ventral view. (26) Dorsosejugal region. (27) Anterior part of podosoma in lateral view.

***Gigantoppia* gen. n.**

DIAGNOSIS: Very large, robust species, its notogaster very high, semicircular. Prodorsum with long, well-developed costulae bearing lamellar setae. Sensillus setiform, some tubercles in the interbothridial region. Exobothridial region granular. Nine

pairs of medium-long notogastral setae. Apodemes well-developed, posterior border with postepimeral fossa. Genitoanal setal formula: 5 - 1 - 2 - 3. Lyrifissures *iad* in adanal, setae *ad*₃ in preanal position.

TYPE SPECIES: *Gigantoppia magna* sp. n.

REMARKS: In some peculiar features (e.g., thick and long costulae, long setiform sensillus, postepimeral fossa) *G. magna* sp. n. greatly differs from all other known oppioid species. As the relationships of the new genus and species are unclear, I provisionally place it in the subfamily Granloppiinae Balogh, 1983. Further studies are necessary.

Gigantoppia magna sp. n.

Figs 28-30

MATERIAL EXAMINED: Holotype: Phang Nga Prov., Khao Lak National Park, Tone Chong Fa Waterfall, 100-300 m, Winkler extraction in moist primary forest with secondary spots, 6.-15. I. 1998, leg. A. Schulz & K. Vock (As-T-3). 3 paratypes in the same sample. 1 paratype: Phang Nga Prov. & city, near Tapan Cave, 20 m (soil at base of limestone cliff), 9. IX. 2004, leg. P. Schwendinger. Holotype and 2 paratypes deposited in MHNG, 2 paratypes (1761-PO-2008) in HHNM.

DIAGNOSIS: Rostral apex blunt, wide. Prodorsum with well-developed, curved costulae, its surface distinctly granular laterally. Sensillus long, setiform, slightly dilated medially. Notogaster hemispherical, high. Ten pairs of notogastral setae, setae *c*₂ vestigial. Epimeral region strongly sclerotised, a row of angular fields present in front of the sejugal apodemes. Last epimeral borders with a well-developed fossa. Genito-anal setal formula: 5 - 1 - 2 - 3, setae *ad*₁ in postanal, *ad*₃ in preanal, lyrifissures *iad* in para-anal position.

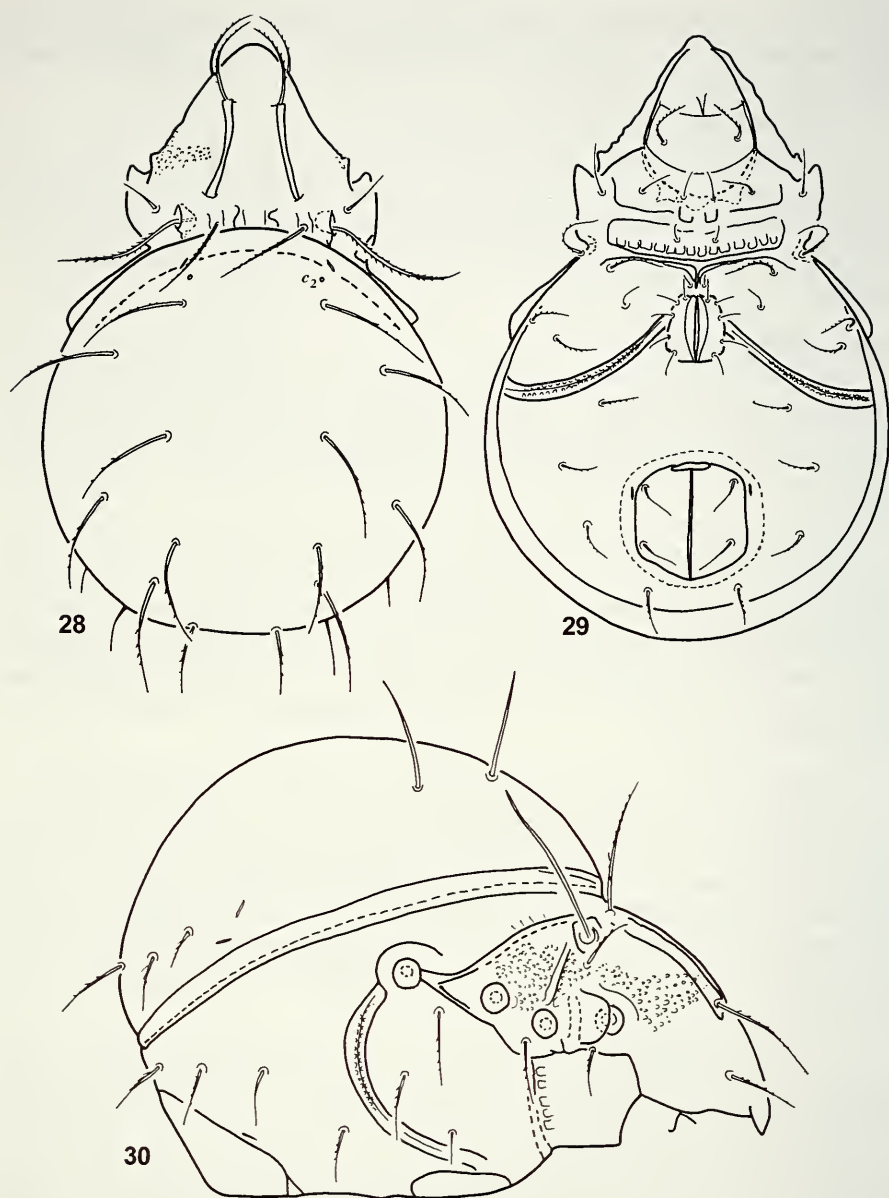
MEASUREMENTS: Length of body 845-997 μ m, width of body 581-638 μ m.

DESCRIPTION: *Prodorsum*: Rostral apex wide, rounded in dorsal, beak-shaped in lateral view. Prodorsal surface with well-developed, diverging costulae (Fig. 28) reaching bothridia, their distal end bearing lamellar setae. A narrow, transversal median field connected to distinctly granular lateral region. Two pairs of irregular projections present basally in the interbothridial region. Bothridium small, cup-shaped, sensillus long, setiform, slightly dilated medially, finely ciliate, similar to other prodorsal setae. Ratio of these setae *ex* < *ro* > *le* > *in*.

Notogaster: Highly rounded (Fig. 30). Setae *c*₂ represented only by their alveoli, six pairs of notogastral setae of nearly medium length, distinctly pilose. Posteromarginal setae much shorter than preceding ones, setae *ps*₁ longest, setae *ps*₃ the shortest among them (Fig. 28).

Lateral part of podosoma: Exobothridial region distinctly granular (Fig. 30), its anterior part larger, posterior part covered by smaller granules. Pedotecta 1 round, pedotecta 2-3 reduced, discidium very long, without sharply pointed distal end.

Ventral parts: Epimeral region strongly sclerotised, anterior epimeres not touching each other medially, without median borders. Sejugal and posterior apodemes well-developed, sejugal borders double, *bo. 4* with fossa, with some granules (Fig. 29). A row of small, angular fields ornamenting this surface parallel to sejugal border. Inner pairs of epimeral setae (*1a*, *2a*, *3a*) thin, smooth, all other pairs thicker and pilose. Genito-anal setal formula: 5 - 1 - 2 - 3, all genital setae fine, thin, arranged in one row



FIGS 28-30

Gigantoppia magna gen. n., sp. n. (28) Body in dorsal view. (29) Body in ventral view. (30) Anterior part of podosoma in lateral view.

near lateral margin of anal plates. Aggenital and adanal setae pilose, thicker than anal ones. Setae ad_1 in postanal, ad_2 in para-anal and ad_3 in preanal position. Lyrifissures *iad* located very near to anal aperture, at the anterior corner.

Legs: Narrow, the segments long.

REMARKS: The placement of the new species is problematic; see remarks to the new genus.

ETYMOLOGY: The specific epithet refers to the extraordinary body size of these mites.

***Pulchroppia sculpturata* sp. n.**

Figs 31-33

MATERIAL EXAMINED: Holotype: Thailand, Trang Prov., Khao Chong Botanical Garden, 02. XII. 2003, leg. A. Orosz & G. Sziráki (As-832). 1 paratype from the same sample. Holotype (1762-HO-2008) deposited in HHNM and paratype in MHNG.

DIAGNOSIS: Rostrum elongate. Costula long, a pair of lateral laths also observable. Two pairs of tubercles basally and four pairs of maculae medially in the interbothridial region. Rostral setae simple, lamellar and interlamellar ones distinctly pilose. Sensillus with seven rami. Posteromarginal surface of notogaster ornamented with flat pustules. Ten pairs of notogastral setae present, setae c_2 minute, all others long. Sejugal apodemes with one pair of large tubercles. Epimeral and ventral surface with strong polygonate sculpture. Lyrifissures *iad* in para-anal position.

MEASUREMENTS: Length of body 427-452 μm , width of body 188-201 μm .

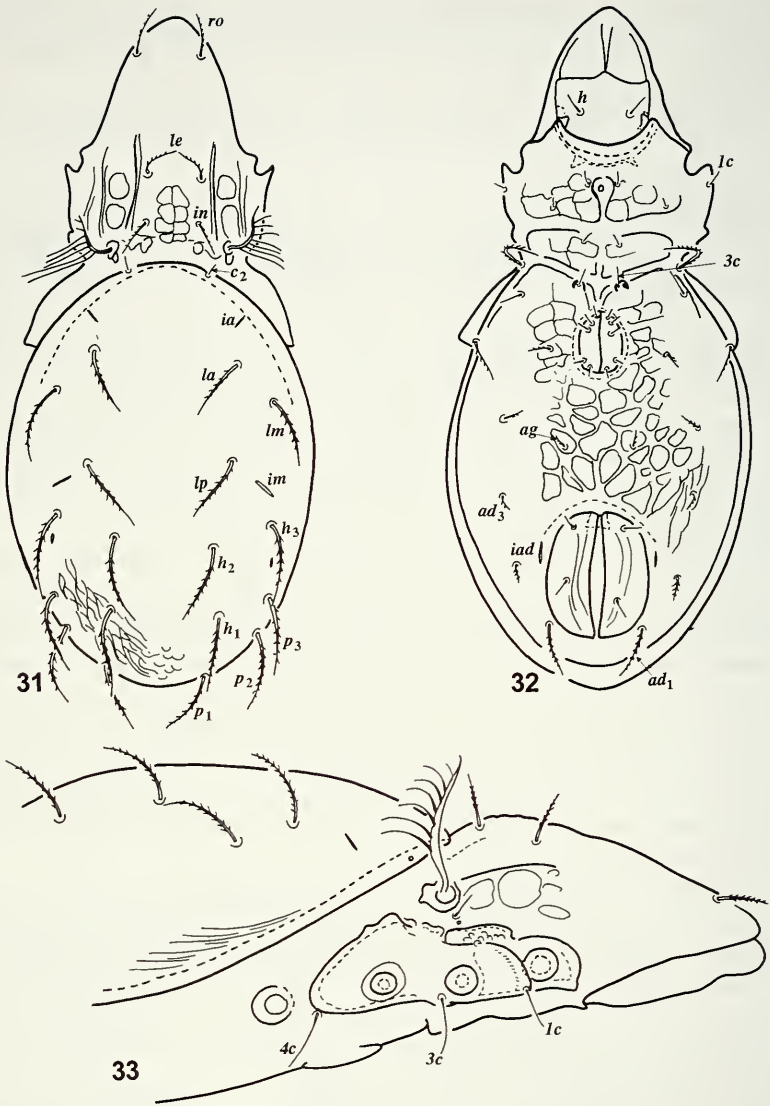
DESCRIPTION: *Prodorsum*: Rostrum elongate, its median part rounded anteriorly. Rostral setae located laterally, very far from each other. Lamellar lines distinct, a pair of lateral laths also clearly visible. Along the lateral laths two pairs of larger and some smaller alveoli present (Fig. 31). Lamellar setae situated between the lamellar lines, far from distal end of prodorsum. Rostral setae hardly, lamellar and interlamellar setae distinctly pilose. Basal part of interlamellar region with four pairs of maculae, basal margin of this field with a pair of larger and a pair of smaller tubercles. Bothridium with a large posteromarginal tubercle. Sensillus pectinate, its seven branches curved, varying in length.

Notogaster: Dorsosejugal suture convex, crista absent. Its posteromarginal surface ornamented with flat, irregularly arranged pustules, framed by rugae (Fig. 31). Some irregular rugae present also along median margin. Ten pairs of notogastral setae present, setae c_2 minute, short, all others much longer, bearing long and distinct cilia.

Lateral part of podosoma: Exobothridial setae short. A distinct border with some tubercles running along the acetabula dorsally (Fig. 33). Pedotecta 1 small, round. Discidium large, with distinct dorsal margin.

Ventral parts (Fig. 32): Apodemes of epimere 1 well-developed, sternal one ending in a round anterior thickening. Sejugal apodemes also distinct, bearing one pair of round tubercles on their posterior margin. A short part of the sternal apodemes also directed to the genital opening. Epimeral surface ornamented with polygonal pattern, a similar one observable on ventral surface medially. Epimeral setae mostly short, setae $3c$ and $4c$ conspicuously long, distinctly ciliate. Surface of genital plates smooth, anal plates with longitudinal ribs. Adanal setae different in length, ad_1 the longest, ad_3 the shortest. Lyrifissures *iad* in para-anal position, located near to the anal opening.

REMARKS: On the basis of the long notogastral setae, as well as the interlamellar pattern, the new species is closest to *Pulchroppia granulata* Mahunka, 1988 and *P. ele-*



FIGS 31-33

Pulchroppia sculpturata sp. n. (31) Body in dorsal view. (32) Body in ventral view. (33) Anterior part of podosoma in lateral view.

gans Hammer, 1980. The notogastral setae of *P. elegans* are smooth (conspicuously ciliate in the new species), interlamellar setae of *P. granulate* are long (short in the new species). The new species is distinguishable from these two species also by the pattern of the ventral plate. It is medially completely covered by a polygonal pattern which is partly absent in the two congeners. The new species is distinguished from *P. mala-*

pectinata (Corpuz-Raros, 1979) by the presence of c_2 setae (absent in *malapectinata*) and by the form of the sensillus.

ETYMOLOGY: The species name refers to the sculpture of the prodorsum and the notogaster.

Subiasella (Lalmoppia) khaolak sp. n.

Figs 34-36

MATERIAL EXAMINED: Holotype: Thailand, Phang Nga Prov., Khao Lak National Park, Tone Chong Fa Waterfall, 100-300 m, Winkler extraction in primary moist forest with secondary spots, 6.-15. I. 1998, leg. A. Schulz & K. Vock (As-T-3). 9 paratypes from the same sample. Holotype and 6 paratypes deposited in MHNG and 3 paratypes (1763-PO-2008) in HNHM.

DIAGNOSIS: Prodorsum with weak lamellar and distinct lateral lines. Two pairs of large maculae in interbothridial region. Bothridium with wide posteromarginal tubercles, sensillus distinctly dilated, fusiform, distal margin with 8-9 cilia in one row on its distal margin. Notogastral setae short, curved. Apodemes and epimeral borders (except *bo. 4.*) well- developed, *bo. 3.* and *bo. 4.* absent. Sejugal borders with a pair of large tubercles. Setae short, simple, situated in genito-anal position, except for setae ad_1 and setae ad_2 . Five pairs of genital setae present.

MEASUREMENTS: Length of body 275-302 μm , width of body 132-143 μm .

DESCRIPTION: *Prodorsum*: Rostral part of prodorsum widely rounded, without distinct apex. Rostral setae situated laterally, far from each other. A pair of short costulae present, lamellar setae situated near distal end of the costulae, at their inner margins (Fig. 34). A pair of strongly sclerotised lateral laths also present; two pairs of interbothridial maculae, between them a short, weak crest visible. Bothridium large, with wide posterior tubercles. Sensillus lanceolate, directed mostly backwards, its head wide, with medium-long cilia only on one side.

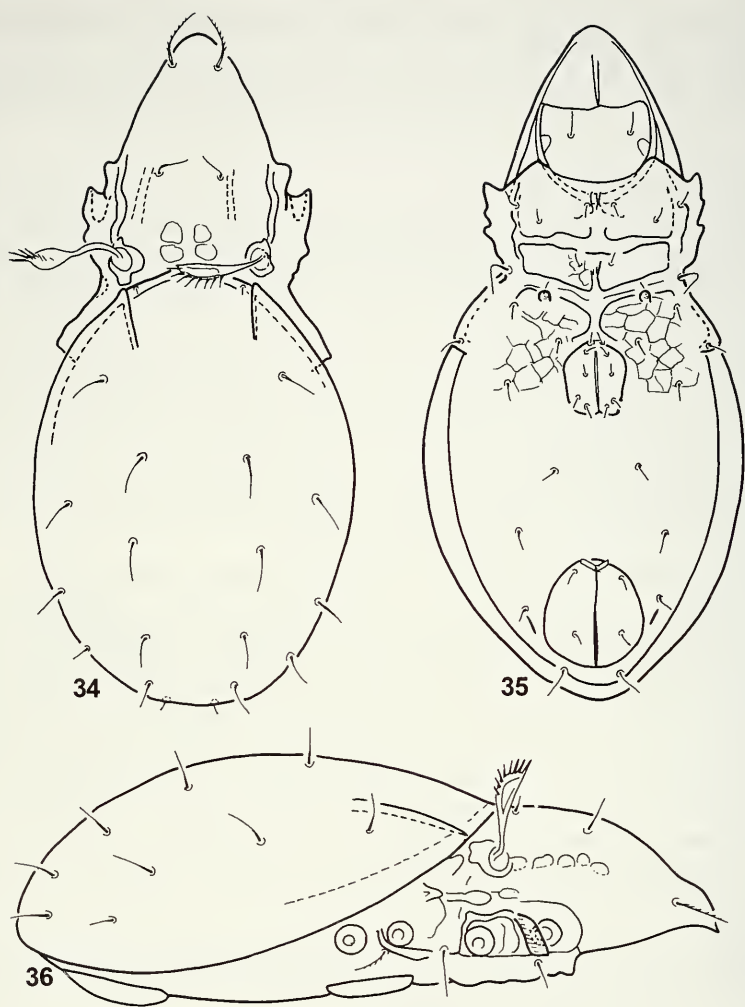
Notogaster: Elongate. A pair of long, well-developed cristae present. Ten pairs of setiform, characteristically curved notogastral setae present, setae c_2 much shorter than the others, hardly visible.

Lateral part of podosoma: Exobothridial region smooth, without granules or small tubercles, but well sclerotised. A large protuberance behind the bothridium and a longitudinal crest bearing exobothridial setae observable (Fig. 36). Pedotecta 1 clearly visible.

Ventral parts (Fig. 35): Epimeral region clearly delimited laterally by a pair of longitudinal crests, its surface with irregular pattern. Apodemes and epimeral borders (except *bo. 4.*) well- developed, but anterior part of sternal apodeme reduced, *bo. 4* absent. One pair of strong tubercles visible in sejugal region bearing setae *3b*. Epimeral setae varying in length. Five pairs of genital, one pair of aggenital, two pairs of anal setae, setae ad_3 setae short, ad_1 and ad_2 much longer. Lyrifissures *iad* in direct apoanal position.

Legs: All of normal oppioid type. Solenidium ϕ_1 situated on a well-developed process of tibia I.

REMARKS: The new species is primarily characterized by the absence of posterior epimeral borders, by its prodorsal sculpture, and by the single pair of ventral sejugal tubercles. On this basis it is closely related to the genus *Subiasella* (*Lalmoppia*)



FIGS 34-36

Subiasella (Lalmoppia) khaolak sp. n. (34) Body in dorsal view. (35) Body in ventral view. (36) Body in lateral view.

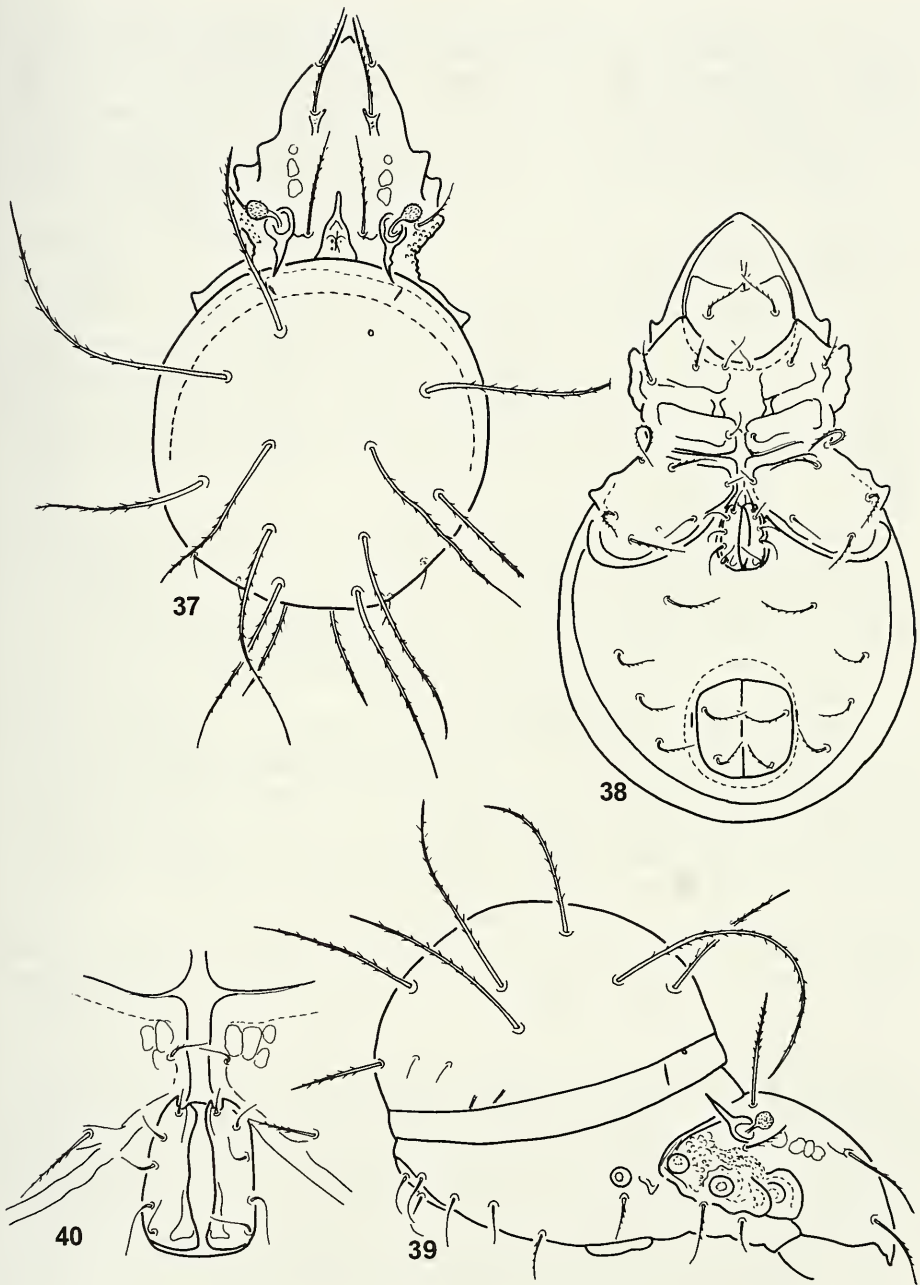
Subias & Rodriguez, 1986. In the form of its prodorsal costula and sensillus, and in its large sejugal tubercles *Subiasella (Lalmoppia) khaolak* sp. n. is distinct from its relatives.

ETYMOLOGY: The new species is named after its type locality.

***Vietoppia insitiva* sp. n.**

Figs 37-40

MATERIAL EXAMINED: Holotype: Thailand, Phang Nga Prov., Khao Lak National Park, Tone Chong Fa Waterfall, 100-300 m. Winkler extraction in primary moist forest with secondary spots, 6.-15. I. 1998, leg. A. Schulz & K. Vock (As-T-3). 1 paratype in the same sample. Holotype deposited in MHNG, paratype (1764-PO-2008) in HHNM.



FIGS 37-40

Vietoppia insitiva sp. n. (37) Body in dorsal view. (38) Body in ventral view. (39) Body in lateral view. (40) Genital region.

DIAGNOSIS: Rostrum conical. A pair of short lamellar costulae and basally an unpaired lanceolate crest observable. Bothridium with a long, spiniform extension directed backwards. Sensillus short, its head round. Notogaster strongly arched. Ten pairs notogastral setae, setae c_2 represented only by their alveoli, setae ps_2 and ps_3 fine, very short, all others very long, curved and setiform. Epimeral setal formula: 3 - 1 - 3 - 3, genito-anal setal formula: 5 - 1 - 2 - 3. Adanal setae in para-anal or pre-anal position.

MEASUREMENTS: Length of body 510-582 μm , width of body 312-325 μm , height of notogaster 264 μm .

DESCRIPTION: *Prodorsum:* Rostral apex pointed, beak-shaped in lateral view. Costulae reduced, only their blunt cusp observable, bearing lamellar setae. Some (mostly 4) pairs of spots laterally on the prodorsal surface and an unpaired lancetiform structure located in the interbothridial region basally (Fig. 37). Bothridium with a peculiar, long, narrow and sharply pointed expansion directed backwards. Peduncle of sensillus short and curved, its head round, aciculate. All prodorsal setae setiform, ciliate, their ratio $ex < ro < le < in$.

Notogaster: Very high, hemispherical (Fig. 39). Ten pairs of notogastral setae present, among them setae c_2 vestigial, ps_2 and ps_3 short, very fine, filiform and smooth, seven pairs of long, setiform; setae lm the longest, setae ps_1 the shortest of all, lm directed forwards. All these seven pairs of setae distinctly ciliate.

Lateral part of podosoma: Exobothridial region granulate (Fig. 39). Pedotecta 1 roundish, pedotecta 2-3 reduced, discidium large.

Ventral parts: Epimeral region strongly sclerotised, but apodemes partly reduced (Fig. 38). Epimeres partly not touching each other, sternal region delimited by thick crests medially on both sides. Sejugal borders double, very thick. Posterior borders of epimeral region curved. Infracapitulum large, setae h robust. Among the epimeral setae three inner pairs thin, filiform, all others much thicker and distinctly ciliate. Genital aperture small, narrow, much smaller than anal aperture. Genital plates incised anteriorly (Fig. 40), anterior setae situated on them. All setae thin, smooth, comparatively long. Aggenital, anal and adanal setae similar in length, distinctly ciliate. No adanal setae in postanal position, setae ad_3 situated far anteriorly and laterally (Fig. 38). Lyrifissures iad located in adanal position, very close to anal aperture.

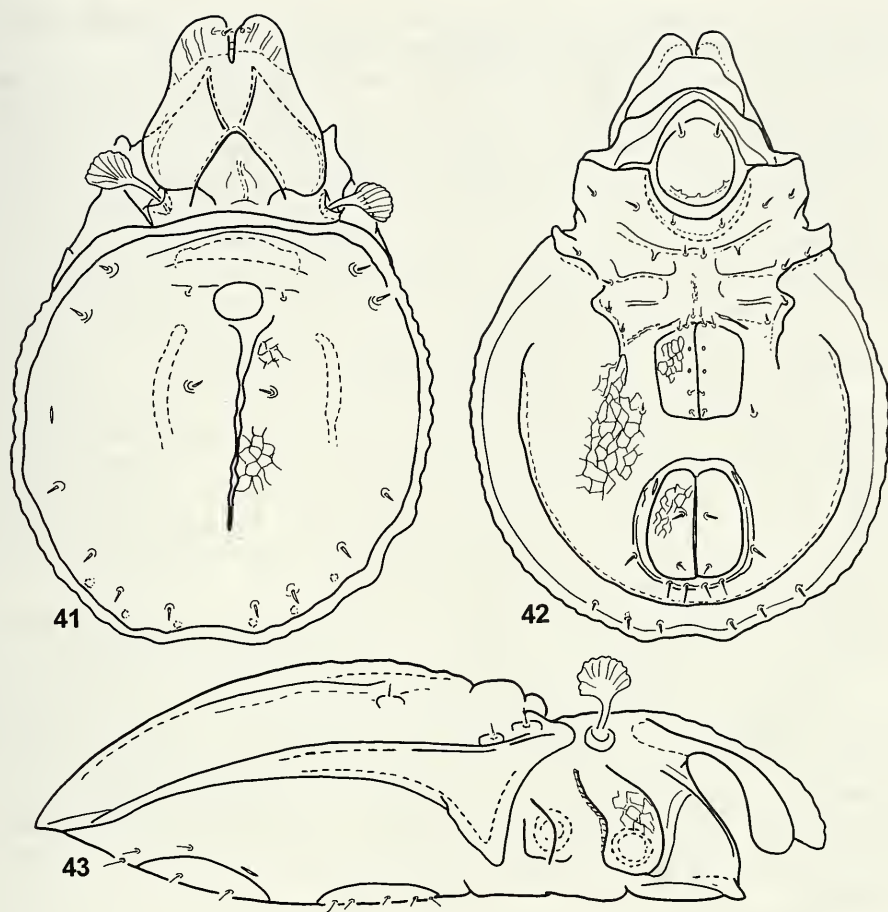
REMARKS: The new species is well characterised first of all by the position of its adanal setae and lyrifissures, by the shape of the body, and by the number and shape of the notogastral setae. On the basis of these characters the new species can be placed in the genus *Vietoppia* Balogh & Mahunka, 1968. However, some features, e.g. the presence of the costular apex, the interbothridial projection and the form of the bothridium, distinguishes it from the related species. These features need further study.

ETYMOLOGY: The species name refers to the peculiar bothridial characteristic which is not known to exist in other species of the family Ooppiidae.

Mahunkaia schwendingeri sp. n.

Figs 41-43

MATERIAL EXAMINED: Holotype: Thailand, Phang Nga Prov. & city, near Tapan Cave, 20 m (soil at base of limestone cliff), 9. IX. 2004, leg. P. Schwendinger (TH-04/17). Holotype deposited in MHNG.



FIGS 41-43

Mahunkaia schwendingeri sp. n. (41) Body in dorsal view. (42) Body in ventral view. (43) Body in lateral view.

DIAGNOSIS: Body flat, notogaster becoming thinner posteriorly, its surface covered with a cerotegument layer. Lamellae covering anterior part of prodorsum; lamellar setae short, situated on margin of lamellar cusps. Interlamellar setae absent; sensillus clavate, very broad. Notogaster rounded, with undulating posterior margin. Ten (maybe eleven) pairs of short, spiniform notogastral setae present. Lenticulus rounded, in front of it a large protuberance, behind it a deep split (?) present. Ventral plates and surface of genital and anal plates with polygonate pattern. All setae spiniform, short, adanal setae situated on a semicircular crest. Legs tri- and heterodactylous.

MEASUREMENTS: Length of body 407 μm , width of body 291 μm .

DESCRIPTION: *Prodorsum:* Lamellae large, rounded anteriorly and laterally, covering almost the entire prodorsal surface, leaving free only its basal part. This part

with weak ridges. Short and spiniform lamellar setae situated on inner margin, interlamellar setae reduced. Head of the sensillus large, fan-shaped (Fig. 43).

Notogaster: Dorsosejugal region convex medially, pteromorphae large, rounded in dorsal, liguliform in lateral view. Notogaster peculiarly flattened in lateral view, rounded, lateral margin undulating, posterior margin with deep pits in dorsal view (Fig. 41). A large, distinctly protruding protuberance behind the anterior margin. Inner surface with deep fissure and two pairs of depressed fields, mostly with polygonal pattern. Lenticulus broad, wider than long. Six pairs of larger spiniform, short and thin notogastral setae in dorsal view, one pair of hardly observable setae next to lenticulus, and three pairs of posteromarginal (*p*) setae in ventral position. Lyrifissures normal.

Lateral part of podosoma: Pedotecta 1 very large, its surface polygonate. Pedotecta 2 small, triangular. Tutorium narrow, consisting of curved laths.

Ventral parts: Infracapitulum of galumnoid type. Setae *h* situated near anterior margin. Epimeral surface with irregular pattern. Apodemes I touching medially, other ones ending far from each other. Epimeral setal formula: 3 - 1 - 2 - 2, all setiform, some minute, hardly observable (*1a*, *4a*). Surface of ventral plate distinctly polygonate (Fig. 42), with some ridges around genital and anal openings. Genito-anal setal formula: 6 - 1 - 2 - 3, all setae short and thin. Adanal setae situated on ano-adanal crests. Lyrifissures *iad* located at anterior edge of anal plates.

Legs: Strongly damaged, only tarsi of leg II visible. This tri- and heterodactylous, with median claw much thicker and larger than the two lateral ones.

REMARKS: On the basis of the peculiar flattened body and the spiniform notogastral and ventral setae, the new species can be placed in the genus *Mahunkaia* Schatz, 2002. The new species is clearly distinguishable from the other species of this genus by the shape of its sensillus and lenticulus, by the polygonate sculpture of the ventral, genital and anal plates, and by the position of the adanal setae (see Schatz, 2002). All previously known species of the genus were described from the Ethiopian Region.

ETYMOLOGY: I dedicate the new species to Dr. P. Schwendinger, the curator of the arthropod collections of the Muséum d'histoire naturelle, Geneva, who took many very interesting soil samples and provided this Oribatida material for examination.

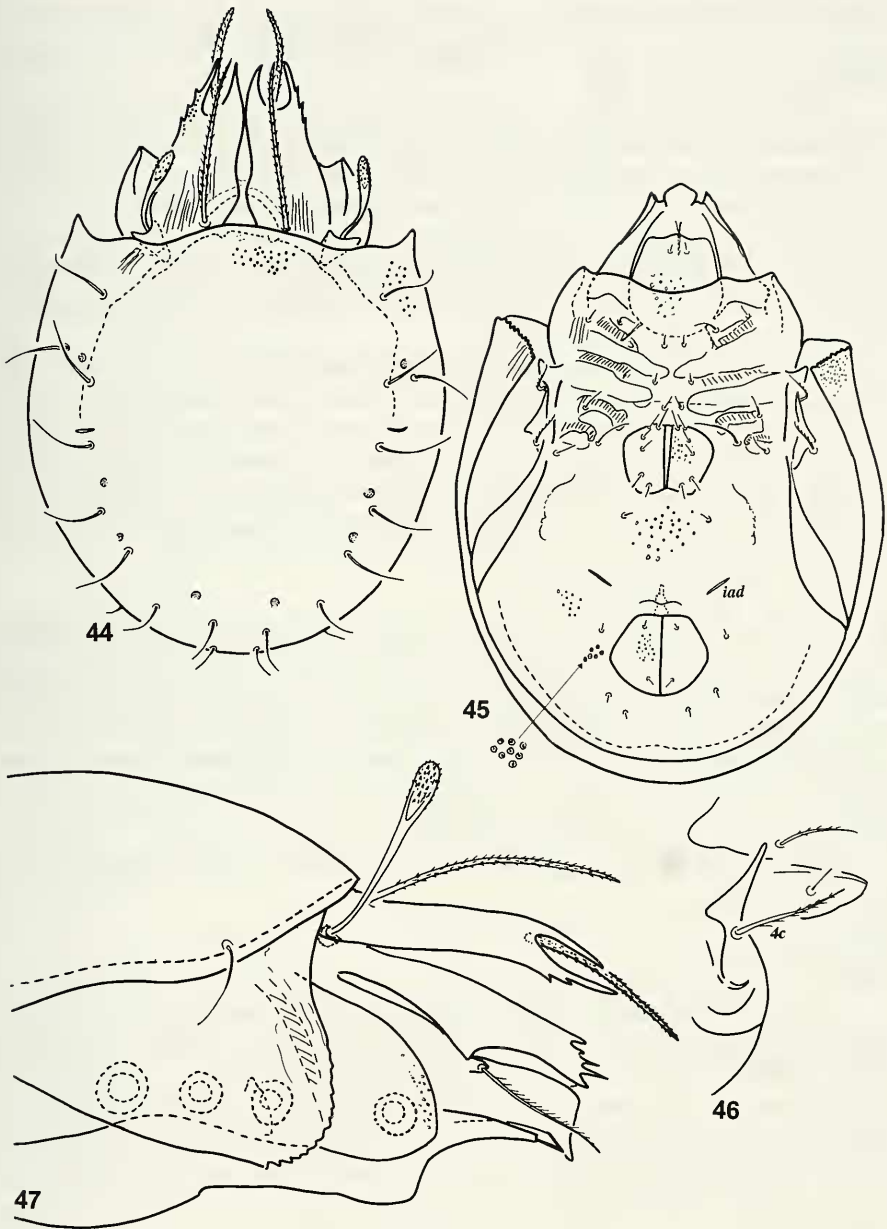
***Oribatella zsilavii* sp. n.**

Figs 44-47

MATERIAL EXAMINED: Holotype: Thailand, Phetchaburi Prov., Kaeng Krachan National Park, 450 m, 19. XI. 1985, leg. D. Burckhardt & I. Löbl (TH-26). 9 paratypes in the same sample. Holotype and 5 paratypes deposited in MHNG, 4 paratypes in HNHM.

DIAGNOSIS: Rostrum without median incisure. Lamellae long, median and lateral cusps nearly equal in length. Lamellar knob absent, lamellae disconnected basally. Sensillus long, longer than pedotecta 1. Surface of notogaster and ventral regions foveolate, foveolae mostly with distinct median puncture. Ventral setae simple, short, spiniform. Setae *4c* moderately long, directed inwards, setiform. Ventral plates and part of epimeral surface ornamented with foveolae like the notogastral ones. Infracapitulum, genital and anal plates with simple foveolae. All legs monodactylous.

MEASUREMENTS: Length of body 306-327 μm , width of body 214-221 μm .



FIGS 44-47

Oribatella zsilavii sp. n. (44) Body in dorsal view. (45) Body in ventral view. (46) Lateral part of epimeral region with discidium and custodium. (47) Anterior part of podosoma in lateral view.

DESCRIPTION: *Prodorsum*: Rostrum convex. Lamellae large, lamellar cusps equal in length (Fig. 44), outer cusp with three to four small teeth laterally. Lamellae with long inner margin not connected to each other, lamellar knob absent, only a weak

transversal crest visible. Lamellar surface punctate anterolaterally and rugose basally. Interlamellar setae long, thinner than lamellar ones. Sensillus (Fig. 47) clavate, very long, longer than pedotecta 1.

Notogaster: Anterolateral margin of pteromorphae distinctly serrate and foveolate. Notogastral surface punctate in dorsosejugal part, foveolate posteriorly. Ten pairs of notogastral setae present, all roughened, their length varying, setae *ps* shorter than the others. Four pairs of clearly developed porose areae also well observable.

Lateral part of podosoma: Tutorium narrow, with three to four long, narrow and two to three short dens (Fig. 47) present. Genal tooth triangular. Pedotecta 1 very large, covering the whole acetabulum. Discidium narrow, custodium long, but much shorter than setiform, distinctly ciliate setae *4c*.

Ventral parts (Fig. 45): Infracapitulum irregularly punctate. Setae *h* short, setiform. Epimeral surface partly ornamented with foveolae with a median point. This sculpture visible also on ventral plate. Epimeral setae (except *3c* and *4c*) short, simple. Setae *4c* the longest of all (Fig. 46), setae *3c* also longer than the other ones. Surface of genital and anal plates ornamented with simple foveolae. Genital and aggenital setae simple. Anal and adanal setae very short. Lyrifissures *iad* located very far anteriorly, in direct apoanal position.

Legs: All legs monodactylous.

REMARKS: The new species is well characterized by lacking an interlamellar tooth, by its notogastral and ventral sculpture, the serrated margin of its pteromorphae, and by its monodactylous legs. On the basis of this combination of features, the new species is closest to *Oribatella sculpturata* Mahunka, 1987. However, the inner and outer lamellar apices are equal in length in *zsilavii* sp. n. (of different length in *sculpturata*) and the lyrifissures *iad* are situated in front of the anal aperture in *zsilavii* (located near the anterior margin in *sculpturata*).

ETYMOLOGY: I dedicate the new species to Dr. Fábian Zsilavi (Hedervár, com. Győr-Sprón, Hungary) for his help in my work.

ACKNOWLEDGEMENTS

I thank the Muséum d'histoire naturelle de Genève and Dr. P. Schwendinger, curator of its arthropod collections, for providing the samples for study. Further thanks go to the collectors of the material examined and to the collaborators of the museums of Geneva and Budapest (Hungarian Natural History Museum). P. Schwendinger also helped preparing this manuscript and improved the English text. This work was partly supported by the Hungarian Scientific Research Fund (OTKA, number T45889).

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